Knowledge Representation - W6 Lab 7 - Inference

Ruairí D. O'Reilly

This weeks lab focuses on inference using propositional Logic and First Order Logic. It assume you have an understanding of logical agents from both a practical and theoretical perspective and reviewed the logic.ipynb.

I. Propositional Logic - Smart Home System

Bob has a state-of-the-art smart home system. The system has various rules set up to manage the appliances and features of the house efficiently. Bob wants to ensure that when he gets home from work, his house is comfortable and welcoming.

Given Facts:

- If it's dark outside, the living room lights should be turned on.
- If the living room lights are on and it's cold outside, the heater should be turned on.
- If the temperature inside is below 18°C, it's considered cold.
- It gets dark outside by 6 pm.
- Bob usually comes home by 7 pm.

A. Propositional Logic - Smart Home System

1) Construct propositions representing the above facts.
2) Construct rules in propositional logic to add to our KB.

Knowledge Base (Rules in propositional logic):

Now, let's demonstrate the propKB inferring if the heater is on:

- Scenario: Bob enters his home at 7 pm. The temperature outside is 17°C. (EXPECT TRUE)
- Scenario:The temperature is above 18°C. (EXPECT FALSE)

II. First Order Logic - Smart Medical System

In a futuristic healthcare facility, the automated diagnosis system employs First-Order Logic (FOL) to determine potential health conditions based on symptoms reported by the patients. The clinic hopes to leverage forward chaining to predict which treatments might be required for incoming patients based on initial checkup results.

A. Knowledge Base

- If someone has a fever and cough, they might have the flu.
- If someone has the flu, they need antiviral medication.
- If someone has a rash and itchiness, they might have an allergic reaction.
- If someone has an allergic reaction, they need antihistamines.

B. Goal

- Given: John reports he has a fever and a cough. Alice mentions she has a rash.
- Goal: Determine the potential treatments for John and Alice using forward chaining.

C. Solution

- Define your knowledge base using FOL clauses.
- Specify the given facts.
- Use forward chaining to determine the treatments for John and Alice (fol_fc_ask).
- Display the results.

References